Space + Time + Brain: 4D Particle Detectors using Neuromorphic Computing

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Detector in beam
Silicon trackers can be made with good
space + time resolution

Off detector processing
BRAIN
including
Neural Networks

Cluster information

Track+jet information

Single image
Goal: move BRAIN onto detector

Detector in beam
Silicon trackers can be made with good space + time resolution

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Single image
Cluster information

Track+jet information
Use Neuromorphic computing (NC)

Memory and computing elements aren’t separated - MEMRISTORS
Neurons communicate in parallel architecture

NC systems are being developed quickly: we need to start using them with our detectors

Detector has BRAIN
Attached with readout electronics
Example of Detector

Time sequenced jet and track information

Need new algorithms including Spiking Neural Networks
Future

Detector in beam
space + time + brain

Off detector processing

Now have a video with space + time